PRELIMINARY HYDROMODIFICATION ANALYSIS




RANCHO CIELO ESTATES
PARCEL 'VC' - EA LOG NO. 86-06-026B
MARCH 2011

COUNTY OF SAN DIEGO
TM 5440, S04-043, R05-010, SPA 05-004
LOT 109, TM 4229-4, Map No.12764

Prepared For: Rancho Cielo Estates

Prepared By: Fuscoe Engineering, Inc.

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PRELIMINARY HYDROMODIFICATION MANAGEMENT STUDY

RANCHO CIELO PARCEL 'VC' COUNTY OF SAN DIEGO, CA

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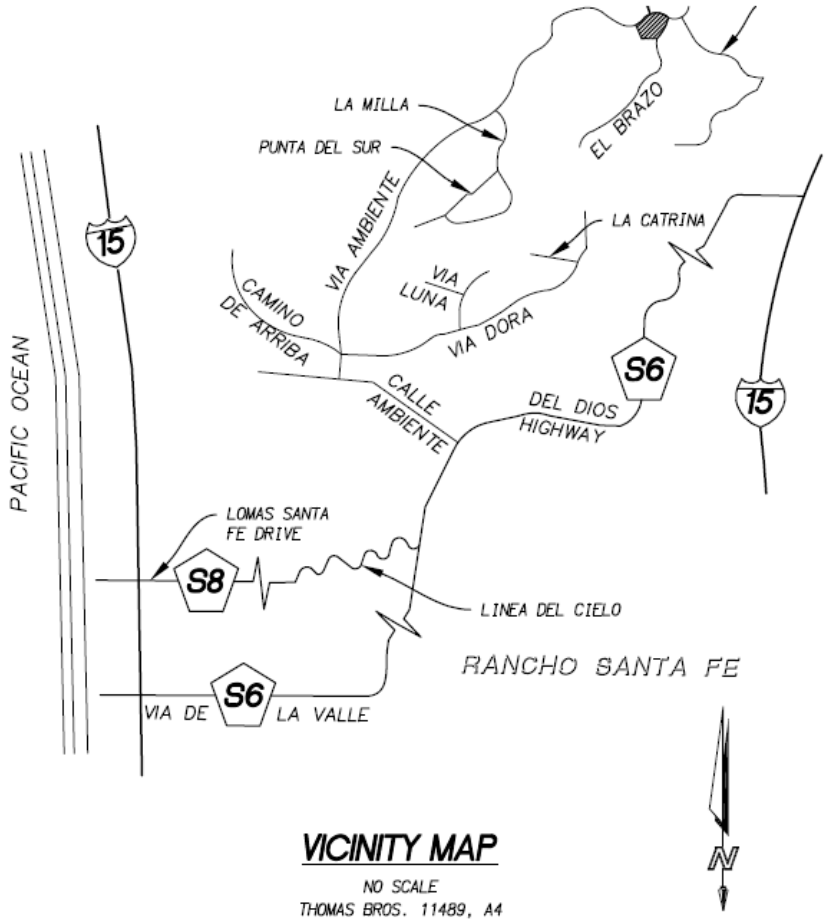

Figure 1 Vicinity Map

1.0 PROJECT DESCRIPTION

This Preliminary Hydromodification Management Study analyzes and proposes mitigation for the hydromodification impacts of the Rancho Cielo Parcel 'VC' project. The proposed development of Rancho Cielo Parcel 'VC' consists of a one-lot condominium project including eleven residential units. The lot will be designated for residential uses with a portion of the lot designated as open space. The project areas is located along Via Ambiente in the community of Rancho Cielo, to the north of Rancho Santa Fe, CA. Refer to the following Vicinity Map.

The project site is 5.59 acres. The existing site is characterized by a hilltop surrounded by steep slopes. Via Ambiente forms the northerly boundary of the project and El Brazo forms the easterly boundary. Low density residential development exists along a portion of the westerly and southerly project boundary, while the remainder of the adjacent area is undeveloped. The proposed project will construct a driveway on Via Ambiente west of the intersection with El Brazo. The residential units will be accessed via a private interior cul-de-sac. street.

2.0 SITE INFORMATION

The following sections summarize the site conditions which relate to drainage and hydromodification, including the geotechnical conditions, drainage basins, and the low flow threshold determination.

2.1 GEOTECHNICAL CONDITIONS

The site soils are classified as San Miguel-Exchequer rocky silt loams (SnG). These soils belong to Hydrologic Soil Group D, representing low infiltration rates. Shallow bedrock is also present, typically at a depth in the range of 4 to 34 inches. A Custom Soil Resource Report prepared by the Natural Resources Conservation Service is provided in Appendix 1 for reference.

Due to the presence of Group D soils and shallow bedrock, infiltration-based Integrated Management Practices (IMPs) are not feasible for the project site.

2.2 DRAINAGE BASINS

Due to the hilltop nature of the site, runoff from the project site splits into several drainage basins.

Basin 1 encompasses the majority of the southern portions of the site. This basin drains to a canyon onsite which drains to the south, conveying flows to the San Dieguito River.

Basin 2 consists of the easterly slope. Runoff from this basin is collected by an existing brow ditch leading to a Type 'F' inlet. This runoff is collected and piped through the existing 18" RCP storm drain and discharges east of El Brazo, a private street. These existing drainage facilities were constructed per TM 4229-2. The runoff then runs down a canyon east of El Brazo and eventually leads to the San Dieguito River. Refer to the Existing Hydrology Map included in the appendix.

Basin 3 is located along the northerly frontage of the project along Via Ambiente. Consisting of street drainage on Via Ambiente and runoff from the northerly slope, the basin leads to an existing catch basin near the intersection with El Brazo. The catch basin connects to an underground storm drain system which outlets to a canyon to the east of the intersection of Via Ambiente and El Brazo. This canyon flows southwest to a confluence with the San Dieguito River.

2.3 LOW FLOW THRESHOLD DETERMINATION

An assessment of the susceptibility of the receiving channels to erosion was not performed for this project at this time. Therefore, the low flow threshold corresponding to a highly susceptible channel, $0.1Q_2$, was used.

A channel assessment may be preformed during future phases of design. Due to the steep and rocky nature of the surrounding canyons, a future channel assessment may reveal the receiving channels to be of medium or low susceptibility to erosion. If this is the case, future phases of the design may be based on the low flow thresholds which correspond to the assessed susceptibility.

3.0 METHODOLOGY

The hydromodification analysis for Rancho Cielo Parcel 'H' has been done in accordance with the Final Hydromodification Management Plan, dated January 14, 2011.

3.1 DRAINAGE MANAGEMENT STRATEGY

The drainage management strategy for the project utilizes multifunction IMPs to provide water quality treatment, hydromodification mitigation, and peak detention for the developed portions of the site. Points of Compliance (POCs) have been identified where the proposed storm drain system will discharge to the surrounding natural drainage courses or to the existing storm drain system. If the project proposes to increase un-mitigated post-development flows to a POC, an IMP was then designed to mitigate the impacts of the increase. The IMPs then discharge to the natural drainage courses or existing storm drain system. Where an IMP discharges to a natural drainage course, energy dissipation will be provided.

To size the IMPs, the areas tributary to each IMP were delineated into Drainage Management Areas (DMAs). Separate DMAs were created for proposed impervious areas, such as roofs and pavement, and proposed pervious areas, including landscape and slopes. Refer to the Hydromodification Management Exhibit in Appendix 5 for the location of each POC, IMP, and DMA.

3.2 BMP SIZING CALCULATOR

The San Diego Hydromodification Sizing Calculator, developed by Brown and Caldwell, was utilized to size the IMPs. As the proposed IMP is a detention basin, the "Pond Sizer" feature of the Calculator was used. The IMP was sized for "Treatment + Flow Control". The project is located on Type D soils within the Oceanside rainfall basin. The existing site slopes are steep for all the project basins. The output from the Calculator, as well as screen capture images of the input data entered into the Calculator, can be found in Appendix 2.

4.0 CALCULATIONS/RESULTS

4.1 POC 1.1

A storm drain system is proposed within Basin 1. The POC has been designated at the discharge point of this storm drain system. POC 1.1 is the outlet point of Basin 1. DMA 1.1 IMP encompasses the impervious areas draining to POC 1.1, while DMA 1.1 PER encompasses the pervious areas. The following table summarizes the DMAs which drain to POC 1.1.

DMA #	DMA Type	Area (Ac)	Soil Type	Slope	Pre-Project Cover	Post-Project Cover
1.1 IMP	Drains to Pond	0.96	D	Steep	Pervious	Impervious
1.1 PER	Drains to Pond	1.33	D	Steep	Pervious	Pervious

IMP 1.1 is a multifunction basin which is proposed to mitigate the hydromodification impacts to POC 1.1. The basin will be unlined with 2:1 side slopes and a maintenance road providing access to the bottom of the pond. Runoff will enter the pond from the proposed storm drain system as well as surface flow from the surrounding slopes. Discharge from the pond will be controlled by an outlet structure consisting of a double Type G catch basin. Orifice openings will be provided in the side of the catch basin to meter out low flows in order to meet hydromodification requirements. The top opening of the catch basin will serve as an overflow for the pond in the event of the clogging of the orifices. The total depth of the pond will be 7', with the catch basin grate set at a depth of 6'. Thus, the depth considered for hydromodification management is 6'. A 1" diameter orifice will be provided at the bottom of the pond and an 8" diameter orifice will be provided at a depth of 5.0'. The properties of IMP 1.1 are summarized in the table below.

IMP #	Low Flow Threshold	Upper Flow Threshold	Bottom Area		Top Area		Volume	
			Min.	Provided	Min.	Provided	Min.	Provided
1.1	0.05 cfs	1.0 cfs	1375 sf	3100 sf	2032 sf	8800 sf	13,629 cf	31,000 cf

Since IMP 1.1 was sized for treatment and flow control, the pond will also function as an extended detention basin. See the project's Storm Water Management Plan for further information. IMP 1.1 has also been designed to serve as a peak detention basin for Basin 1. See the project's Preliminary Drainage Study for further information. Refer to Appendix 2 for output from the Calculator, and Appendix 3 for a schematic diagram of the proposed outlet structure for IMP 1.1.

4.4 POC's 2-3

No hydromodification mitigation is required for POC's 2 and 3. This is due to the reduction in areas draining to these POC's, and the minor amounts of development proposed within their tributary areas. POC's 2 and 3 are located at the downstream terminus of their respective drainage basins. No impervious surfaces are proposed in Basins 2 and 3, and the areas of both of these Basins will be reduced, leading to a reduction in discharge to POC's 2 and 3. Although the areas within the drainage basins will change due to the proposed development, diversion between basins has been kept below 1 acre. The table below lists the existing and proposed areas, runoff coefficients, and 100-year discharges from these basins.

Basin	Existing			Proposed		
	Runoff Coefficient	Area (Ac)	Q100 (cfs)	Runoff Coefficient	Area (Ac)	Q100 (cfs)
2	0.35	1.10	2.68	0.35	0.44	1.15
3	0.51	1.04	4.41	0.59	0.92	4.07

5.0 MAINTENANCE

Maintenance of the proposed IMP will be performed by the Rancho Cielo Parcel 'VC' homeowner's association. Until the formation of the homeowner's association, Rancho Cielo Estates or the current owner of the property will be responsible for maintenance. Maintenance of the IMP will include landscape maintenance of the vegetation within the basins, and ensuring that the orifices, overflow inlets, and storm drain pipes remain clear of obstructions.

6.0 SUMMARY AND CONCLUSIONS

The hydromodification mitigation measures proposed for the Rancho Cielo Parcel 'VC' project will satisfy the requirements of the Final Hydromodification Management Plan. In portions of the project where discharges will increase, this will be achieved through the use of a detention basin IMP which will reduce runoff flows and durations from the developed areas of the project to below pre-project levels for the flow range of $0.1Q_2$ to Q_{10}. The IMP has been designed using the San Diego Hydromodification Sizing Calculator. Proper energy dissipation will also be provided where necessary. Maintenance of the IMP will be performed by the Rancho Cielo Parcel 'VC' homeowner's association. Please refer to the Storm Water Management Plan and Preliminary Drainage Study for further information regarding the water quality and peak detention aspects of the proposed IMPs.

7.0 APPENDICES

Appendix 1 *Custom Soils Resource Report*

Appendix 2 *BMP Sizing Calculator Output*

Appendix 3 *Outlet Structure Details*

Appendix 4 *Existing Hydrology Exhibit*

Appendix 5 *Hydromodification Management Exhibit*

Appendix 1

Custom Soil Resource Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Diego County Area, California

Rancho Cielo Parcels H and VC

February 25, 2011

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:2,550 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

San Diego County Area, California (CA638)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
SnG	San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes	20.4	100.0%
Totals for Area of Interest		**20.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Diego County Area, California

SnG—San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes

Map Unit Setting

Elevation: 400 to 3,300 feet
Mean annual precipitation: 15 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 220 to 280 days

Map Unit Composition

San miguel and similar soils: 45 percent
Exchequer and similar soils: 35 percent
Minor components: 20 percent

Description of San Miguel

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Residuum weathered from metavolcanics

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 to 34 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 15.0
Available water capacity: Low (about 3.5 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: ACID CLAYPAN (R019XD062CA)

Typical profile

0 to 8 inches: Silt loam
8 to 18 inches: Clay loam, silty clay loam, clay
18 to 23 inches: Gravelly clay loam, gravelly silty clay loam, gravelly clay
23 to 27 inches: Unweathered bedrock

Description of Exchequer

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Concave

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: 4 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.5 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: SHALLOW LOAMY (R019XD060CA)

Typical profile

0 to 10 inches: Gravelly silt loam
10 to 14 inches: Unweathered bedrock

Minor Components

Rock outcrop

Percent of map unit: 10 percent

Escondido

Percent of map unit: 5 percent

Friant

Percent of map unit: 5 percent

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

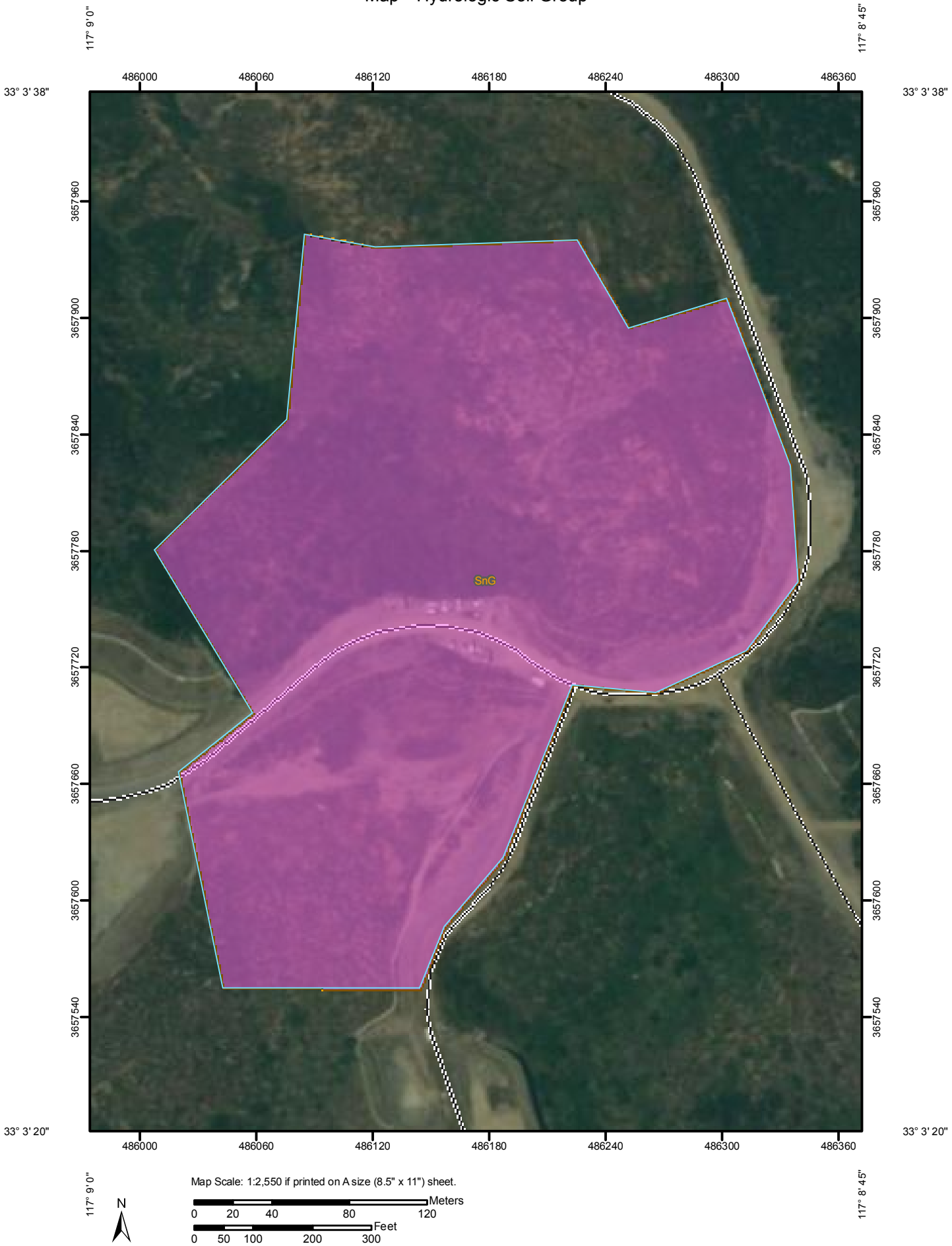
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:2,550 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
SnG	San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes	D	20.4	100.0%
Totals for Area of Interest			**20.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

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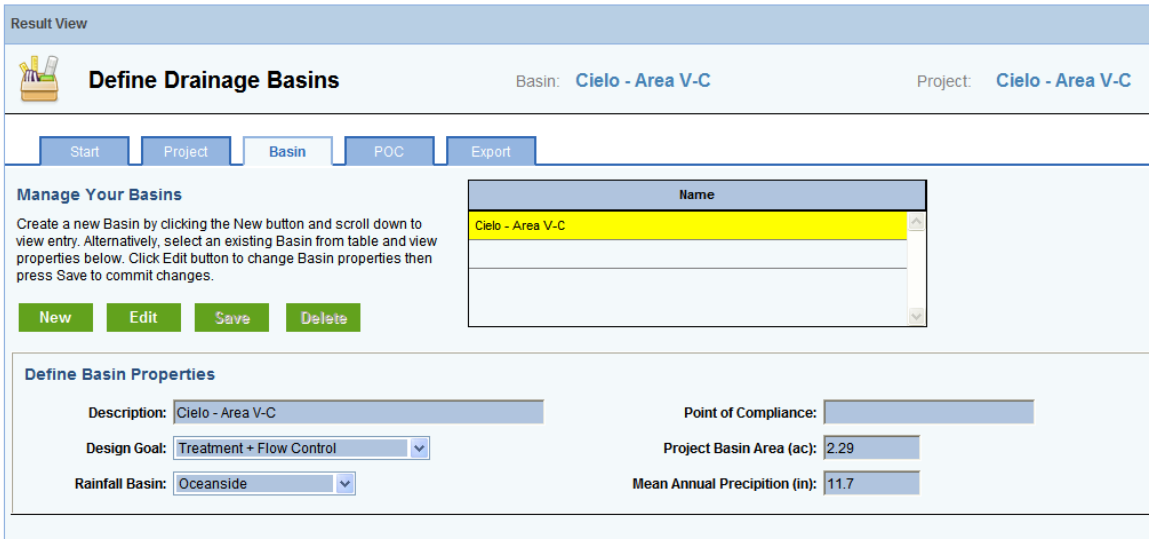
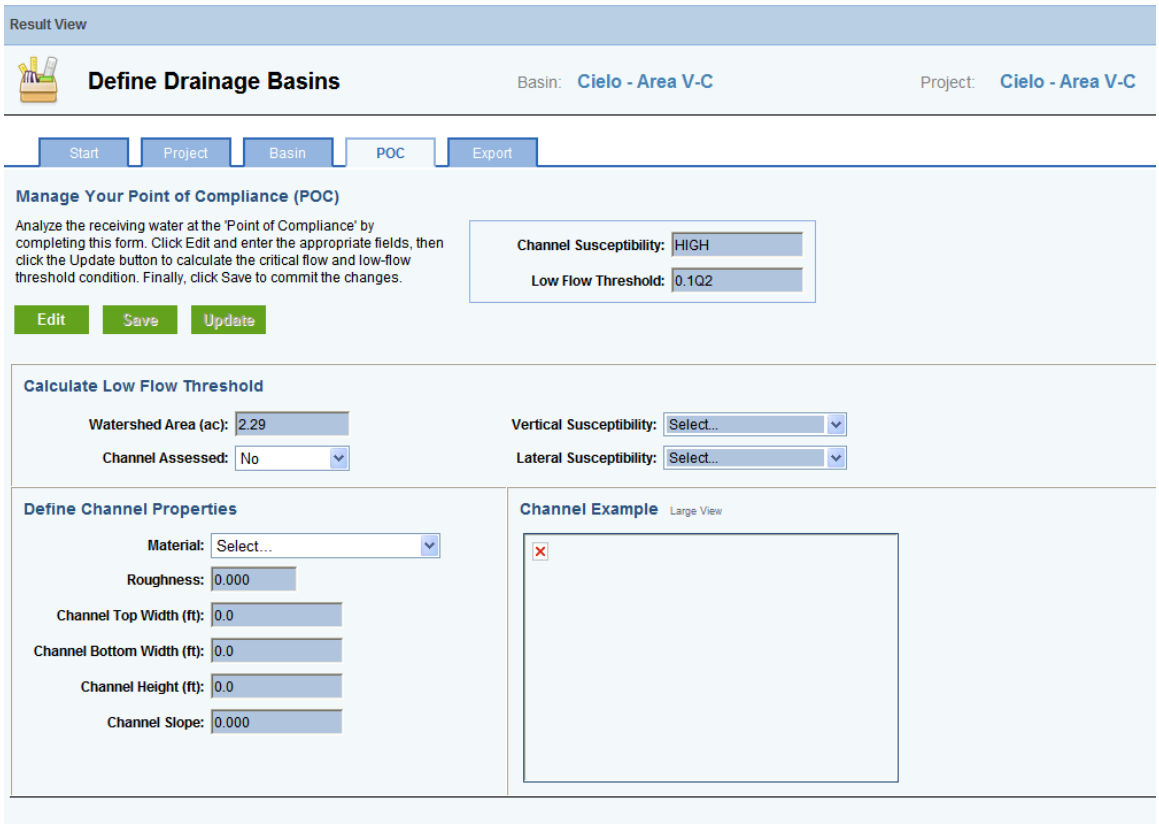
Appendix 2

BMP Sizing Calculator Output

SCREEN CAPTURES FROM SAN DIEGO HYDROMODIFICATION SIZING CALCULATOR

PROJECT DEFINITION





Result View

Size Pond Facility

Basin: Cielo - Area V-C Project: Cielo - Area V-C

Start | DMA | Pond | Report | Export

Manage Your DMA's

Create a new DMA by clicking the New button and scroll down to view entry. Alternatively, select an existing DMA from table and view properties below. Click Edit button to change DMA properties then press Save to commit changes.

New | Edit | Save | Delete

DMA ID	Description
1695	Impervious Areas
1696	Pervious Areas

Define DMA Properties

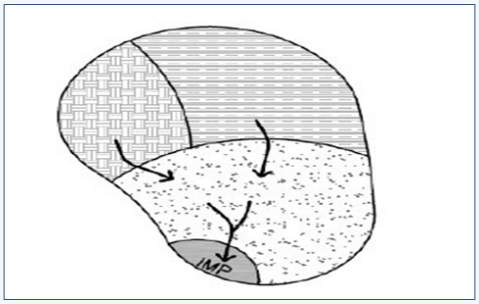
DMA Type: Drains to Pond Drainage Area (ac): 0.96

Drainage Soil: Type D (high runoff - clay soils) Pre-Project Cover: Pervious (Pre)

Slope: Moderate (5 - 10%) Post-Project Cover: Impervious (Post)

Warnings:

DMA Layout Large View



Result View

Size Pond Facility

Basin: Cielo - Area V-C Project: Cielo - Area V-C

Start | DMA | Pond | Report | Export

Manage Your DMA's

Create a new DMA by clicking the New button and scroll down to view entry. Alternatively, select an existing DMA from table and view properties below. Click Edit button to change DMA properties then press Save to commit changes.

New | Edit | Save | Delete

DMA ID	Description
1695	Impervious Areas
1696	Pervious Areas

Define DMA Properties

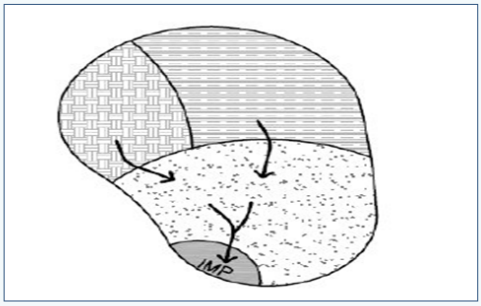
DMA Type: Drains to Pond Drainage Area (ac): 1.33

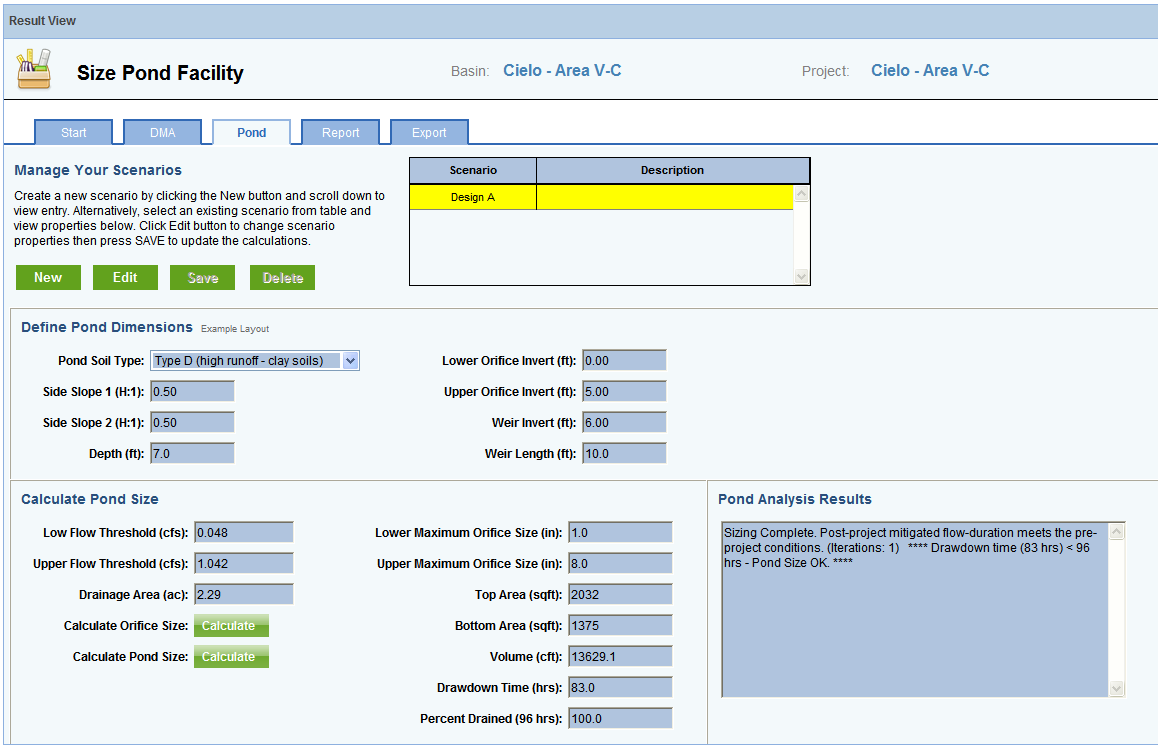
Drainage Soil: Type D (high runoff - clay soils) Pre-Project Cover: Pervious (Pre)

Slope: Moderate (5 - 10%) Post-Project Cover: Pervious (Post)

Warnings:

DMA Layout Large View




Result View
Size Pond Facility
Basin: Cielo - Area V-C
Project: Cielo - Area V-C
Start
DMA
Pond
Report
Export
Manage Your Scenarios
Create a new scenario by clicking the New button and scroll down to view entry. Alternatively, select an existing scenario from table and view properties below. Click Edit button to change scenario properties then press SAVE to update the calculations.
New
Edit
Save
Delete
Scenario
Description
Design A
Define Pond Dimensions
Example Layout
Pond Soil Type:
Type D (high runoff - clay soils)
Side Slope 1 (H:1):
0.50
Side Slope 2 (H:1):
0.50
Depth (ft):
7.0
Lower Orifice Invert (ft):
0.00
Upper Orifice Invert (ft):
5.00
Weir Invert (ft):
6.00
Weir Length (ft):
10.0
Calculate Pond Size
Low Flow Threshold (cfs):
0.048
Upper Flow Threshold (cfs):
1.042
Drainage Area (ac):
2.29
Calculate Orifice Size:
Calculate
Calculate Pond Size:
Calculate
Lower Maximum Orifice Size (in):
1.0
Upper Maximum Orifice Size (in):
8.0
Top Area (sqft):
2032
Bottom Area (sqft):
1375
Volume (cft):
13629.1
Drawdown Time (hrs):
83.0
Percent Drained (96 hrs):
100.0
Pond Analysis Results
Sizing Complete. Post-project mitigated flow-duration meets the pre-project conditions. (Iterations: 1) **** Drawdown time (83 hrs) < 96 hrs - Pond Size OK. ****

Project Summary

Project Name	Cielo - Area V-C
Project Applicant	
Jurisdiction	County of San Diego
Parcel (APN)	
Hydrologic Unit	

Compliance Basin Summary

Basin Name:	Cielo - Area V-C
Receiving Water:	
Rainfall Basin	Oceanside
Mean Annual Precipitation (inches)	11.7
Project Basin Area (acres):	2.29
Watershed Area (acres):	2.29
SCCWRP Lateral Channel Susceptiblity (H, M, L):	
SCCWRP Vertifical Channel Susceptiblity (H, M, L):	
Critical Shear Stress Flow (cfs):	0.00
Overall Channel Susceptibility (H, M, L):	HIGH
Lower Flow Threshold (% of 2-Year Flow):	0.1

Drainage Management Area Summary

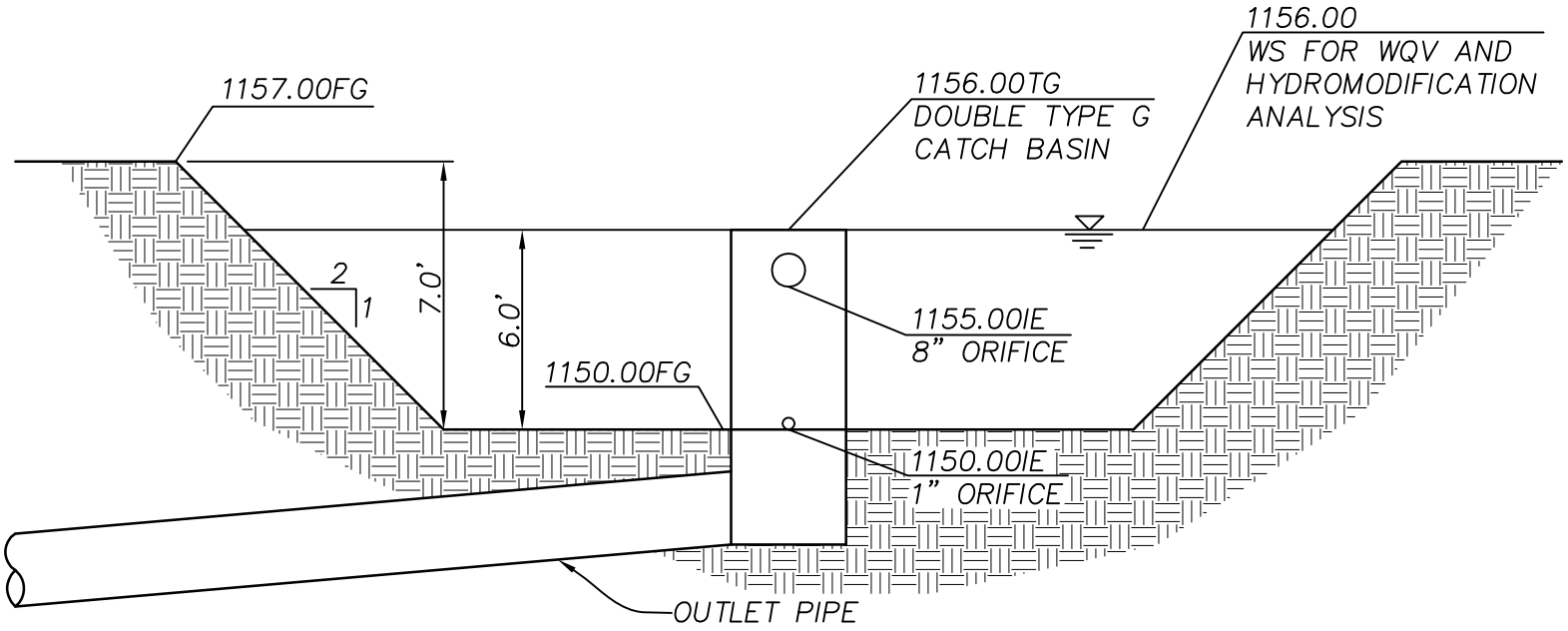
ID	Type	BMP ID	Description	Area (ac)	Pre-Project Cover	Post Surface Type	Drainage Soil	Slope
1695	Drains to Pond	BMP 1	Impervious Areas	0.9	Pervious (Pre)		Type D (high runoff - clay soi...	Moderate (5 - 10%)
1696	Drains to Pond	BMP 1	Pervious Areas	1.3	Pervious (Pre)		Type D (high runoff - clay soi...	Moderate (5 - 10%)

Pond Facility Summary

Scenario	Description	Bottom Area (sqft)	Top Area (sqft)	Depth (ft)	Volume (cft)	Low Orifice (in)	Low Invert (ft)	High Orifice (in)	High Invert (ft)	Weir Length (ft)	Weir Invert (ft)	Facility Soil	Drawdown (hrs)
Design A		1375	2032	7	13629.1	1.00	0.00	8.00	5.00	10.00	6.00	D	83.00

Appendix 3

Outlet Structure Details



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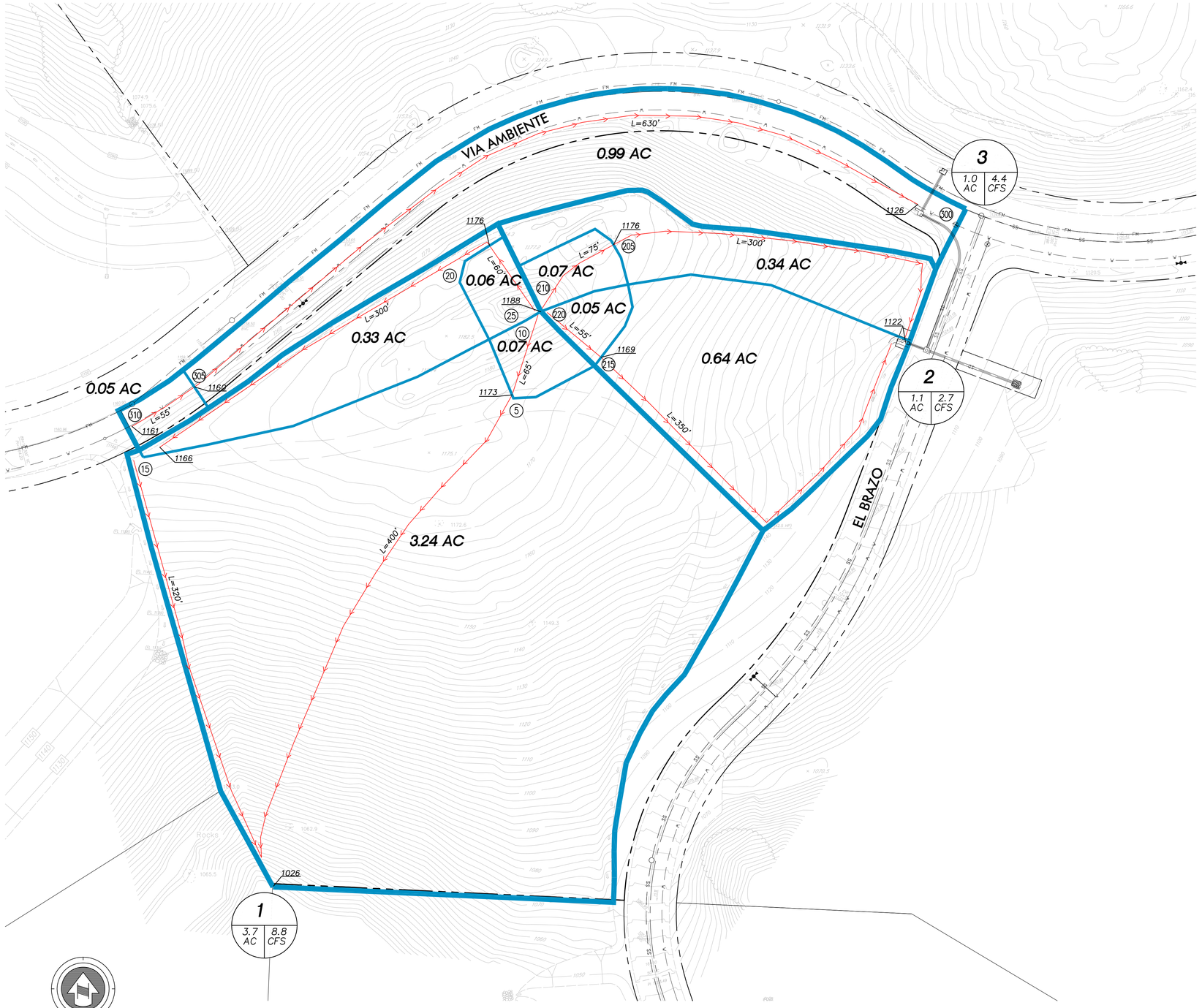
IMP 1.1
OUTLET STRUCTURE DETAIL

NOT TO SCALE

Appendix 4

Existing Hydrology Exhibit



LEGEND

- PROPERTY LINE
- EXISTING LOT LINE
- RIGHT-OF-WAY
- EXISTING CONTOUR
- EXISTING STORM DRAIN
- BASIN BOUNDARY
- FLOW PATH
- HYDROLOGY NODE (XX)
- POINT OF ANALYSIS: X | X AC | X CFS

RANCHO CIELO PARCEL 'VC'
EXISTING 100-YEAR HYDROLOGY
COUNTY OF SAN DIEGO, CA

PROJECT NUMBER: 02711-001-01
DATE: 3/2/11

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tel 858.554.1500 ◦ fax 858.597.0335
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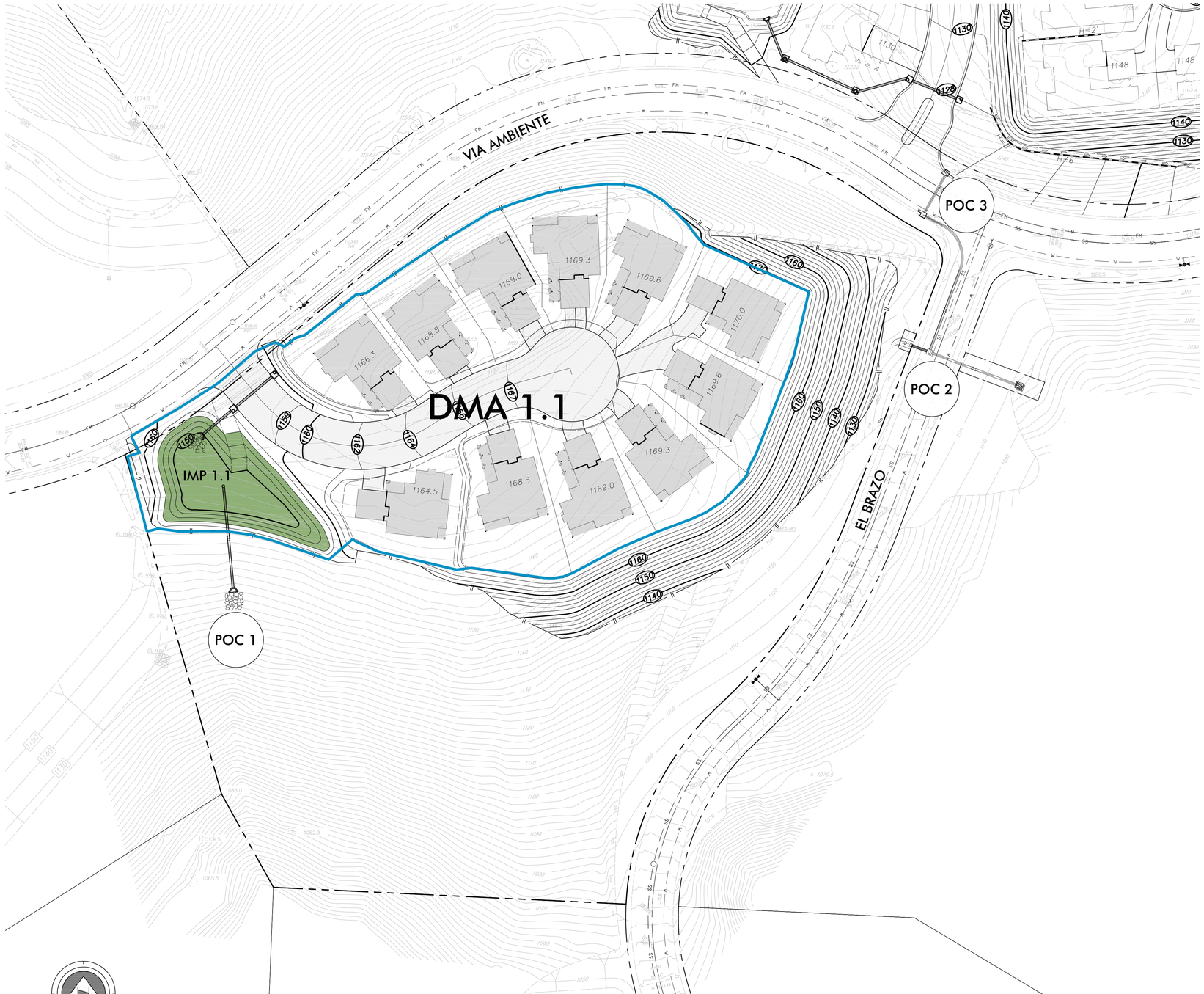
Appendix 5

Hydromodification Management Exhibit



LEGEND

- PROPERTY LINE
- EXISTING LOT LINE
- RIGHT-OF-WAY
- EXISTING CONTOUR
- EXISTING STORM DRAIN
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN
- PROPOSED PAVEMENT
- PROPOSED BUILDINGS
- BASIN BOUNDARY
- POINT OF COMPLIANCE — POC #
- INTEGRATED MANAGEMENT PRACTICE — IMP #

RANCHO CIELO PARCEL 'VC'
HYDROMODIFICATION MANAGEMENT EXHIBIT
COUNTY OF SAN DIEGO, CA

PROJECT NUMBER: 02711-001-01
DATE: 3/2/11

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